The Integrated Unit Simulation System and Representation of the Individual Combatant

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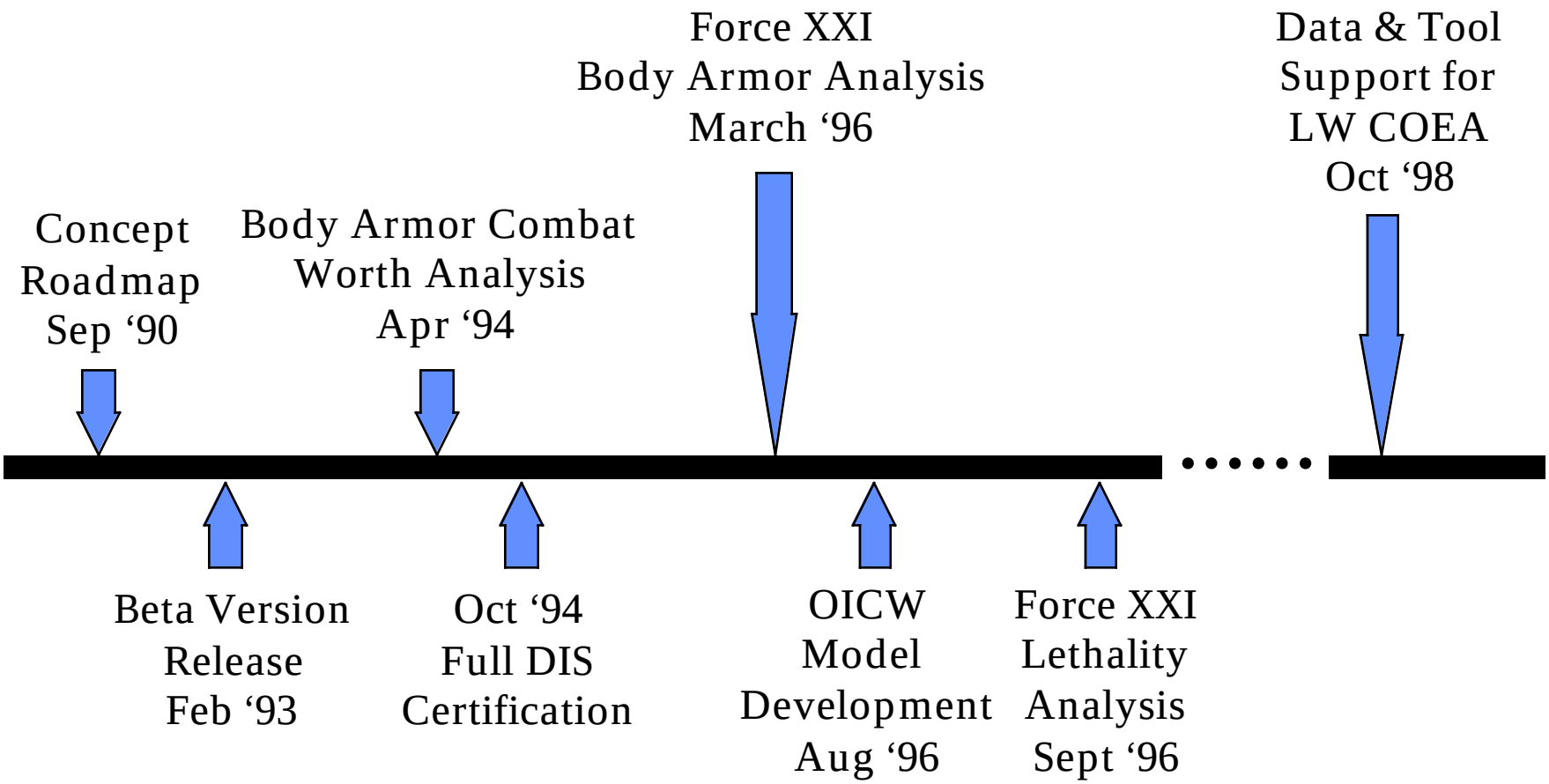
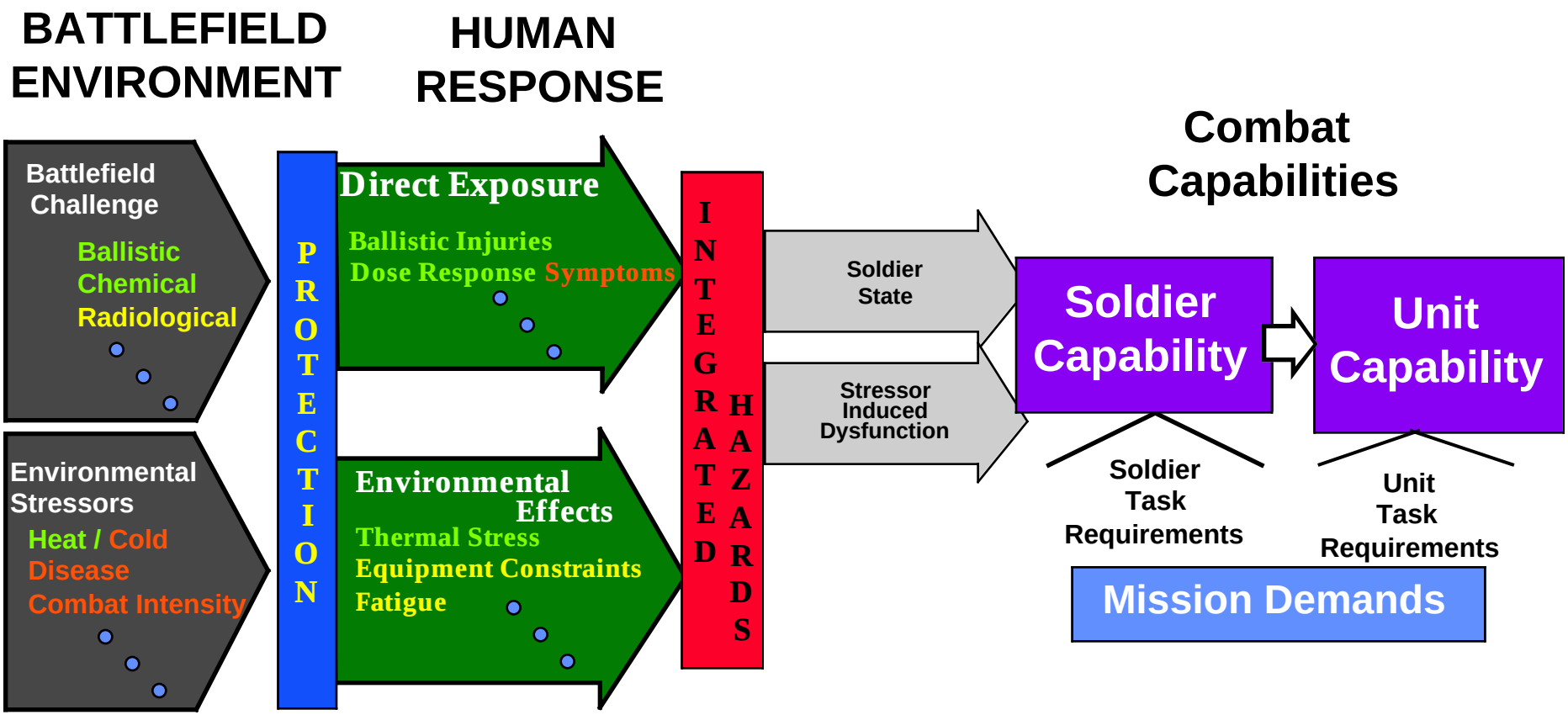
Briefing Outline

- Requirements Timeline
- Simulation Architecture: Current
- Key Factors:
  - Battlefield Environment
  - Mission
  - Soldier State
  - Dynamic Response
- Simulation Architecture: Emerging

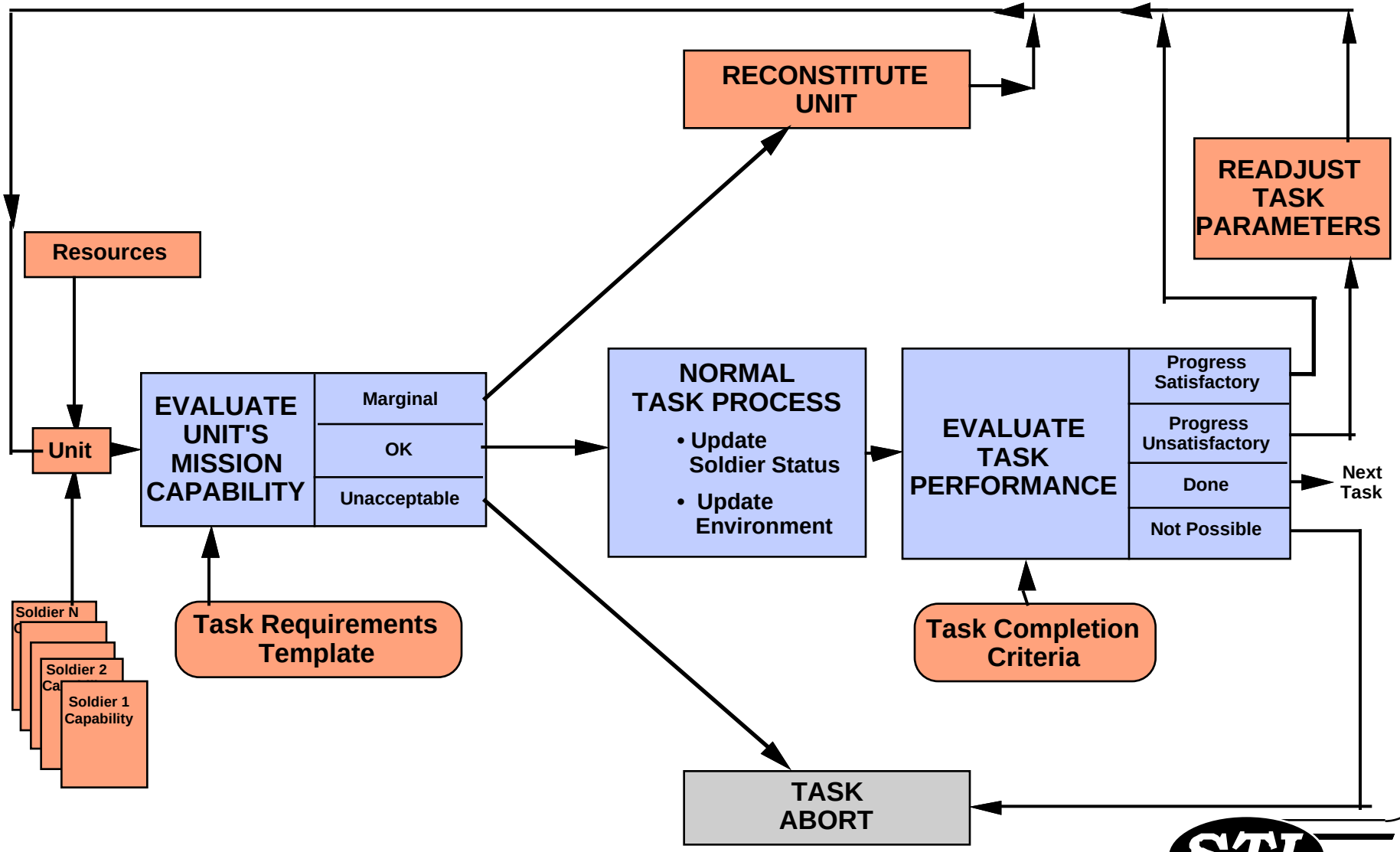
IUSS Requirements Timeline



Current Architecture : Simulation Flow



Current Architecture : BOS-T Simulation Loop



Battlefield Environment

Terrain	Dynamic Processes	Weather / Phenomenology	Distributed Processes
LOS March Rate Z-values from data base	Posture-based exposures e.g. foxholes	Time-dependent weather profiles and chemical contamination overlay patterns	DIS
Simple walls	Stochastic exposure	Night / Day (degraded detection probability)	
Complex cultural features Vegetation	Dynamic human response to terrain: - Path optimization - Cover and concealment	Terrain-dependent NBC contamination Smoke	HLA

Significant Challenges Achievable Current Capability

STI

Mission

Types	Echelon of Command	Medical
BOS-T -Stationary -Move tactically -Attack -Defend Simple combat resolution (Lanchester)	Individual with context of fire team, squad, or platoon	None
BOS-T -React to contact -Reconaissance -Call for fire		Casualty handling tasks
MOUT / MOBA OOTW	Representation of Command and Control	Return to duty (Sustained operations simulation)

Significant Challenges Achievable Current Capability

STI

Soldier State

Physical	Sensory / Perceptual	Cognitive	Social / Emotional	Knowledge
Thermal stress Ballistic injury (Serious or lethal) Chemical Intoxication (Accumulated dose)	Projectile near-miss			
Fatigue	Muzzle flash Explosion Implicit intra-squad comms			Injury to companion
Multiple injury categories & synergistic effects		Explicit situational awareness	Motivation Training National factors	

Significant Challenges Achievable Current Capability

STI

Dynamic Response

IC Behavior "Triggers"	Stressor / Enhancer Performance Effects	Command and Control	HITL
"Simple" suppression Fire on detection	March speed degradation as a function of core temperature	None	None
Movement speed Reaction to terrain	Stressor contribution to probability of hit	Implicit intra-squad comms	Decision point mission direction
Inference-driven behaviors	Task-dependent definition of incapacitation	Explicit message traffic	Virutal / Live interaction

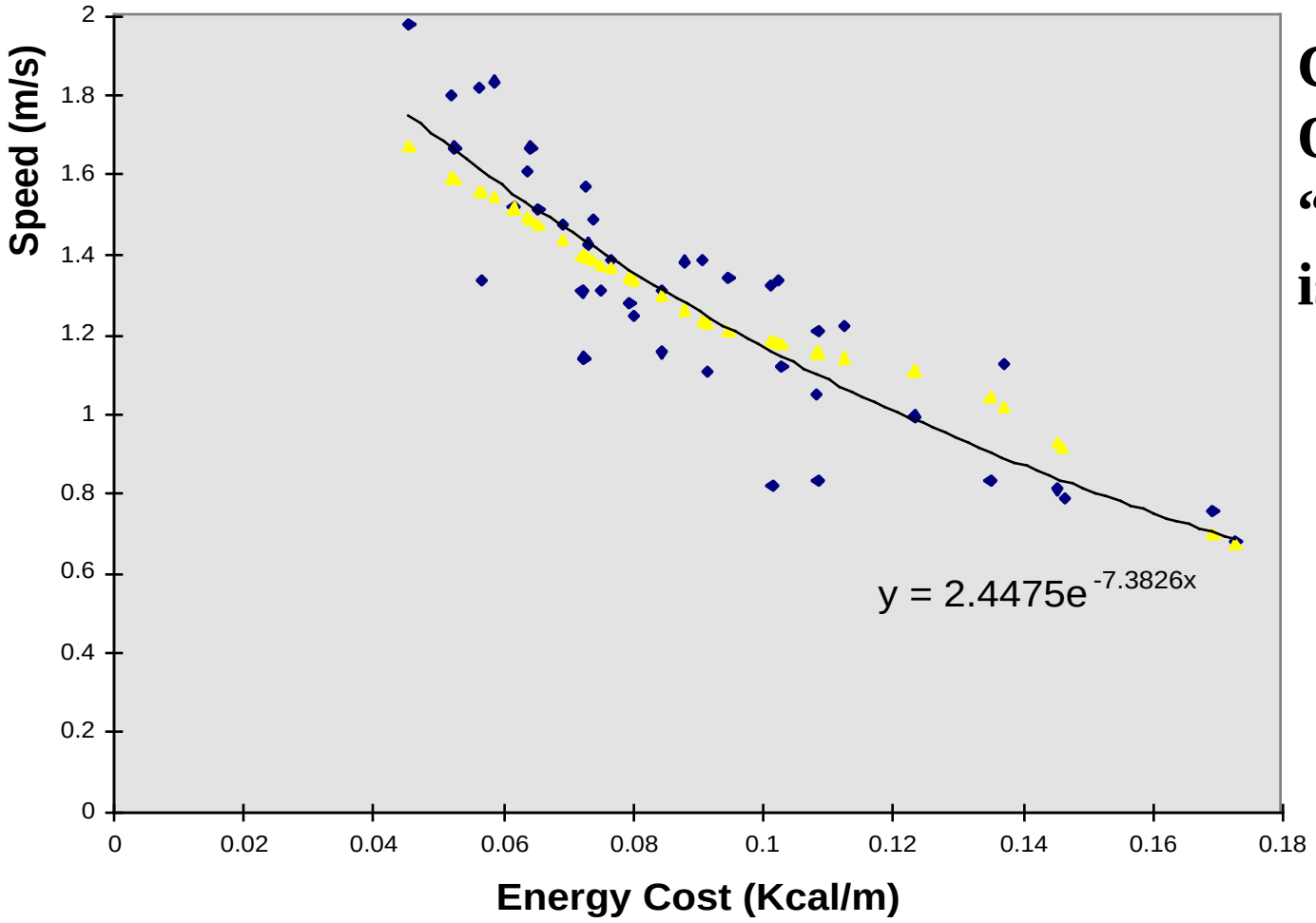
Significant Challenges Achievable Current Capability

STI

Emerging Architecture : Fuzzy Inference Approach

- Rules are Intuitive to User
- Rules Do Not Require Great Expertise to Formulate
- Fuzzy Clusters Can Represent Multi-Modal Data Distributions
- Additional Factors are Easily Incorporated Through Addition of New Rules
- Fuzzy Approach Allows Inconsistent or Contradictory Rules

Emerging Architecture : Movement Speed Example



Correlation of Observed with "Fuzzy" Speeds is 0.91

Emerging Architecture: Suppression Example

Rate of Movement: None Slow Moderate Fast

Use of Cover: none minimal max

Rate of Fire: Round/Min

Type of Fire: 3 ROUND BURST

Posture: CROUCHING

Activity: ENGAGED

Protection: HELMET/BDU'S

Activity

THREAT / VULNERABILITY

low high

INTENSITY

low high

DURATION

short long

LATENCY

short long

PROXIMITY

near far

Inference Engine

Cue

Rate of Movement: None Slow Moderate Fast

Use of Cover: none minimal max

Rate of Fire: Round/Min

Type of Fire: N/A

Posture: CROUCHING

Activity: ENGAGED

Protection: HELMET/BDU'S

Reaction

STI

Other Issues

- Validation
  - Model Test Model
  - Field Exercise Coordination
  - Data Consistency/Availability
- Ownership Support
- Substance and Show

Move Tacticaly (Thermal Effects)